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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No:	**10/802,562**	Examiner:	**Yalkew Fantu**
Filing Date:	**17 March 2004**		
Appellant:	**Jeffrey L. Coleman**	Art Unit:	**2838**

Title: **BATTERY SAFETY MONITOR SYSTEM**

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

28 August 2007

APPELLANT'S APPEAL BRIEF UNDER 37 C.F.R. §41

Sir/Madam:

This is an appeal from Examiner Yalkew Fantu's rejection of claims 1-13 and 15-21, which are set forth in an APPENDIX hereto, and which together comprise all remaining claims in the application. Appellant mailed a Notice of Appeal on 13 August 2007.

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REAL PARTY IN INTEREST

The United States Government and Jeffrey L. Coleman are real parties in interest in this invention.

RELATED APPEALS AND INTERFERENCES

No related appeals and interferences are known to exist in the present case.

STATUS OF CLAIMS

Claims 1-3, 5, 7, and 21 have been finally rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent application publication 2002/0111756 by Modgil (hereinafter *Modgil*). Appellant is unsure as to the status of claim 17. Claim 17 is grouped among the claims that were finally rejected in the Office Action Summary of the last Office Action (hereinafter *Final Action*), but the specific grounds of rejection are not presented in the *Final Action*. On pages 3 and 4 of the *Final Action* there is a paragraph purporting to show how the elements of claim 17 are disclosed in *Modgil*, but the paragraph language tracks the limitations of claim 1 not claim 17. For these reasons, Appellant is unsure as to the status of claim 17. However, Appellant will proceed in this brief under the assumption that it was the Examiner's intention to finally reject claim 17 under 35 U.S.C. 102(b) as being anticipated by *Modgil*.

Claims 4, 6, 8-13, and 18-20 have been finally rejected under 35 U.S.C. 103(a) as being unpatentable over *Modgil* in view of U.S. patent 5,646,534 to Kopera (hereinafter *Kopera*). Claim 15 has been finally rejected under 35 U.S.C. 103(a) as being unpatentable over *Modgil* in view of U.S. patent 6,628,207 to Hemminger (hereinafter *Hemminger*). Claim 16 has been finally rejected under 35 U.S.C. 103(a) as being unpatentable over *Modgil* in view of *Kopera*,

and further in view of *Hemminger*. Claim 14 has been withdrawn. The rejection of claims 1-13 and 15-21 is on appeal.

STATUS OF AMENDMENTS

No amendments have been filed subsequent to the Final Office Action mailed 17 May 2007.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 defines a battery safety monitor system, comprising: (a) at least one battery comprising at least one cell string (page 5, lines 9-10; Fig. 2), wherein said at least one cell string is capable of outputting voltage signals (page 5, lines 13-14); (b) at least one zener diode, operatively coupled to said at least one battery cell string, capable of receiving and reducing voltage signals, and capable of outputting voltage signals (page 5, lines 17-27; Fig. 2); (c) at least one safety device, operatively coupled to said at least one battery cell string, capable of preventing damage to said at least one battery cell string (page 5, lines 12-13; Fig. 3); (d) a microcontroller, operatively coupled to said at least one zener diode, capable of receiving and outputting data (page 6, lines 7-12; Fig. 2); (e) a display device, operatively coupled to said microcontroller, capable of receiving data, and capable of displaying at least one battery voltage level (page 4, lines 28-29; Fig. 1); (f) a power supply, operatively coupled to said microcontroller and said display device, capable of supplying power to said microcontroller and said display device (page 5, lines 4-5; Fig. 1).

Independent claim 7 defines a battery safety monitor system, comprising: (a) at least one string unit, comprising: (i) at least one battery cell string capable of outputting voltage signals (page 5, lines 9-15; Fig. 2); (ii) at least one safety device, operatively coupled to said at least one

battery cell string, capable of preventing damage to said at least one battery cell string (page 5, lines 12-13; Fig. 3); (b) at least one battery monitor, operatively coupled to said at least one string unit (page 5, lines 8-10; Fig. 2), comprising: (i) at least one zener diode capable of receiving and reducing voltage signals, and capable of outputting voltage signals (page 5, lines 9-11; Fig. 2); (ii) a first microcontroller, operatively coupled to said at least one zener diode, capable of receiving and outputting data (page 6, lines 7-12; Fig. 2); and (c) a data collection and display device, operatively coupled to said at least one battery monitor (page 4, lines 9-10; Fig. 1), comprising: (i) a display device capable of receiving data, and capable of displaying at least one battery voltage level (page 4, lines 14-16); and (ii) a power supply, operatively coupled to said battery monitor and said display device, capable of supplying power to said battery monitor and said display device (page 5, lines 4-5; Fig. 1).

Independent claim 17 defines a battery safety monitor system, comprising: (a) a battery cell string capable of outputting voltage signals (page 5, lines 9-11; Fig. 2); (b) a safety device, electrically coupled in series to said battery cell string, wherein said safety device is capable of preventing damage to said battery cell string (page 5, lines 12-15; Fig. 3); (c) a battery monitor operatively coupled to receive said voltage signals (page 5, lines 8-24; Fig. 2), said battery monitor comprising: (i) a zener diode configured to generate low voltage signals responsive to said voltage signals (page 5, lines 25-27; Fig. 2); (ii) an A/D converter configured to transform said low voltage signals into digital signals (page 5, lines 27-30; Fig. 2); and (iii) a first microcontroller configured to transform said digital signals into output digital signals representative of a voltage level of said battery cell string (page 6, lines 7-10; Fig. 2), wherein said first microcontroller is capable of transmitting control signals (page 4, lines 19-21; Fig. 2); and (d) a display device configured to receive said output digital signals, said display device

capable of displaying battery conditions (page 4, lines 28-31; Fig. 1); and (c) a separate power supply, operatively coupled to said battery monitor and said display device, capable of supplying power to said battery monitor and said display device (page 5, lines 6-7; Fig. 1).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Should the 35 U.S.C. 102(b) rejection of claims 1-3, 5, 7, and 21 (and 17?) based on *Modgil*, be overturned when *Modgil* fails to disclose all the elements of the claims?

II. Should the 35 U.S.C. 103(a) rejection of claims 4, 6, 8-13, and 18-20, based on *Modgil* in view of *Kopera*, be overturned when the *Final Action* has failed to establish a *prima facie* case of obviousness?

III. Should the 35 U.S.C. 103(a) rejection of claim 15, based on *Modgil* in view of *Hemminger*, be overturned when the claim upon which claim 15 depends is not obvious?

IV. Should the 35 U.S.C. 103(a) rejection of claim 16, based on *Modgil* in view of *Kopera* and further in view of *Hemminger*, be overturned when the *Final Action* has failed to establish a *prima facie* case of obviousness?

ARGUMENT

I. The 35 U.S.C. 102(b) rejection of claims 1-3, 5, 7, and 21 (and 17?) based on *Modgil*, should be overturned because *Modgil* fails to disclose all the claimed limitations.

> *To establish prima facie obviousness of a claimed invention, **all** the claim limitations must be taught or suggested by the prior art.* (emphasis added) In re Royka, 490 F.2d 981

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The identical invention must be shown in as complete detail as is contained in the ...claim. Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claims 1-3, and 5

Appellant respectfully submits that the 35 U.S.C. §102(b) rejection of claims 1-3 and 5 is improper because each and every element of those claims is not described in *Modgil*. Two of the elements disclosed in claim 1 are: (1) "at least one battery comprising at least one cell string, wherein said at least one cell string is capable of outputting voltage signals;" and (2) "a power supply, operatively coupled to said microcontroller and said display device, capable of supplying power to said microcontroller and said display device." The reference *Modgil* discloses a battery monitor device that draws power from a power circuit that includes the battery it is monitoring. (*Modgil* Fig 12) *Modgil* does not disclose a separate power supply capable of powering a microcontroller and a display device. The *Final Action* maintains that the cigarette lighter plug (1518) of *Modgil's* figure 15D is equivalent to the power supply of claim 1. (*Final Action* page 2) However, *Modgil's* cigarette lighter plug is designed to receive power from the "power transmission circuit" that includes *Modgil's* battery. (*Modgil* page 4, ¶ 0026) The power supply in claim 1 is claimed as its own element and should be treated as such. To treat *Modgil's* power transmission circuit, which includes *Modgil's* battery, as equal to the power supply of claim 1 would be to ignore the plain language of claim 1 and introduce ambiguity into the claim. Why

disclose a battery and a power supply in the same claim unless they were intended to describe separate elements? That the battery of claim 1 and the power supply of claim 1 are separate elements is clear when claim 1 is read in light of the specification. Page 5, lines 6-7 of the current specification provides; "Power supply 160 is separate from battery cells being monitored, and thus, reduces battery power consumption." *Modgil* does not disclose a power supply separate from the battery being monitored. Therefore, Applicant respectfully requests that the 102b rejection of claim 1 be overturned.

Claim 7

Appellant respectfully contends that the 35 U.S.C. §102(b) rejection of claim 7 is improper because each and every element of that claim is not described in *Modgil*. Claim 7 discloses a battery safety monitor system comprising in part "a data collection and display device, operatively coupled to said at least one battery monitor, comprising: i) a display device capable of receiving data, and capable of displaying at least one battery voltage level; and ii) a power supply, operatively coupled to said battery monitor and said display device." These elements are not found in *Modgil*. *Modgil* shows a blinking light or LED, but does not show this light as being part of a data ***collection*** and display device. Furthermore, no power supply (separate from the battery being monitored) is shown in *Modgil*. Therefore, Applicant respectfully requests that the 102b rejection of claim 7 be overturned.

Claim 17

Appellant respectfully contends that the 35 U.S.C. §102(b) rejection of claim 17 is improper because each and every element of that claim is not described in *Modgil*. Claim 17 shares many of the same limitations of claims 1 and 7 that are missing from *Modgil*, as discussed above. In addition, claim 17 discloses a safety device, electrically coupled in series to the battery cell string. *Modgil* does not disclose a safety device electrically coupled in series to a battery string. The *Final Action* points to the MOSFET switch and zener diode of *Modgil* as disclosing a safety device operatively coupled to a battery cell string. (*Final Action* page 3) However, *Modgil's* MOSFET is coupled in parallel with a constant current source. (*Modgil* page 7, ¶ 0089, Fig 12) *Modgil's* zener diode is likewise coupled in parallel with the MOSFET switch. (*Modgil* Fig 12) Because *Modgil* does not show the elements of claim 17 arranged in the way specified in claim 17, Applicant respectfully requests that the 102b rejection of claim 17 be overturned.

Claim 21

Appellant respectfully contends that the 35 U.S.C. §102(b) rejection of claim 21 is improper because each and every element of that claim is not described in *Modgil*. Claim 21 is a dependant of claim 20, which in turn is a dependant of claim 18, which in turn is a dependant of claim 17. Claims 18 and 20 have ***not*** been shown to be anticipated by *Modgil* in the *Final Action*. If a parent claim is not anticipated, any claim that depends from the parent likewise cannot be anticipated. Furthermore, contrary to the apparent position of the *Final Action*, claim 21 is not a Markush claim. Claim 21 discloses several elements and a particular manner of coupling between elements. Appellant maintains that the *Final Action* has failed to show either

expressly or inherently in a single prior art reference each and every limitation of claim 21. Therefore, Applicant respectfully requests that the 102b rejection of claim 21 be overturned.

II. The 35 U.S.C. 103(a) rejection of claims 4, 6, 8-13, and 18-20, based on *Modgil* in view of *Kopera*, should be overturned because the *Final Action* has failed to establish a *prima facie* case of obviousness because (a) the references together do not teach every element of the claims, (b) the modification as proposed by the Examiner would render the primary reference unsatisfactory for its intended purpose, and (c) no one with ordinary skill in the art would reasonably expect the proposed combination to succeed.

> *To establish prima facie obviousness of a claimed invention, **all** the claim limitations must be taught or suggested by the prior art.* (emphasis added)
> In re Royka, 490 F.2d 981

Claim 4

As discussed above in regards to claim 1, *Modgil* fails to disclose a power supply for a battery monitor that is separate from the battery being monitored. *Kopera* likewise fails to disclose such a limitation. Because not all the claimed limitations are taught or suggested by the prior art, the *Final Action* has failed to establish a *prima facie* case of obviousness against claim 4 and the obviousness rejection should be overturned.

Claim 6, 8-11

Each of claims 6 and 8-11 claim a battery safety monitor system that includes "an optoisolator…capable of preventing reverse currents…and capable of receiving power from said power supply." Such a limitation is not taught or suggested in the cited references. The cited references inherently teach away from using an optoisolator that is capable of preventing reverse currents from reaching the battery because both *Modgil* and *Kopera* teach battery monitors for rechargeable-type batteries that depend on reverse currents for recharging. Utilizing an optoisolator that prevents reverse currents from reaching the battery being monitored, as claimed in claims 6 and 8-11, would prevent the rechargeable batteries from being recharged!

The *Final Action* maintains that *Kopera* and *Modgil* may be successfully combined to provide a battery safety monitoring system with an "optoisolator to transmit a high power digital signal across the [border] to the low voltage non-isolated side." (*Final Action* pages 5-6) However, as mentioned above, claims 6 and 8-11 require an optoisolator "capable of preventing reverse currents." (Specification claim 6) The optoisolator taught in *Kopera* is capable of preventing ***direct*** currents from reaching the battery, but does not prevent ***reverse*** currents from entering the battery. Besides using rechargeable batteries, *Kopera* also includes a transformer to supply power to the "isolated" side of its optoisolator, which is another indication that *Kopera* is incapable of preventing reverse currents. (*Kopera* col. 5, lines 8-14 and Fig. 1) Because the cited references fail to disclose all of the limitations of claims 6, and 8-11, and the proposed modification would render *Modgil* unsatisfactory for its intended purpose, no *prima facie* case of obviousness has been established and the rejection against claims 6 and 8-11 should be overturned.

Claim 12

Claim 12 includes the limitation of a wetness detector operatively coupled to an analog-to-digital (A/D) converter. Neither alone nor in combination do *Kopera* or *Modgil* teach a wetness detector operatively coupled to an A/D converter. The *Final Action* maintains that a wetness detector is implicitly disclosed in vehicle safety monitoring systems because "electrolyte leakage of a battery is detected when a voltmeter (voltage sensor) or a thermal sensor reads a decrease in the temperature of a battery due to electrolyte leakages." (*Final Action* page 6) However, a low voltage or temperature reading from a voltmeter or a thermal sensor by itself would not lead someone to conclude that the battery is wet. One skilled in the art would not use a voltmeter or thermal sensor to detect the wetness of a battery because electrolyte leakage does not necessarily equate to a voltage loss. Also, a low voltage or a decreased temperature reading would not lead one skilled in the art to conclude that the battery is wet because there are many other far more likely causes for the reading (ambient temperature change, electrical short, etc). Accordingly, a thermal sensor and a voltmeter are insufficient by themselves to perform as wetness detectors. Therefore, Appellant submits that the *Final Action* has not met its burden of providing a *prima facie* case of obviousness with regards to claim 12.

Claim 18

In regards to claim 18, Appellant maintains that the cited references fail to teach or provide any reason why one skilled in the art would arrange the elements of claim 18 in the manner claimed. The *Final Action* lists the elements of claim 18, but fails to address the interoperability of the elements as claimed. (*Final Action* pages 4-5) Claim 18 provides:

iv) an analog multiplexer configured to receive said control signals, wherein said analog multiplexer is disposed to selectively allow said voltage signals from one battery of said battery cell string to be received by said zener diode in response to said control signals from said first microcontroller; and

v) an optoisolator, configured to transform said output digital signals into isolated digital signals, wherein said display device is configured to receive said isolated digital signals, wherein said separate power supply is configured to supply said power to said optoisolator, and wherein said optoisolator is capable of preventing reverse currents from entering said battery cell string.

The cited references do not disclose an analog MUX disposed to allow voltage signals from one battery of a cell string to be received by a zener diode. Nor do the cited references teach a display device configured to receive isolated digital signals from an optoisolator. Because the cited references do not teach or suggest all the elements, Appellant requests that the rejection be overturned.

Claim 19

Claim 19 limits the battery safety monitor system of claim 18 such that the optoisolator comprises "long wires, configured to receive said power and to guide said isolated digital signals to said display device such that said display device is located remotely from said battery monitor." This limitation was not addressed by the *Final Action*. Therefore, Appellant submits that no *prima facie* case of obviousness has been established with regards to claim 19.

Claim 13 and 20

Claims 13 and 20 include several elements not taught or suggested by the cited references. Claim 13 discloses a data collection and display device that further comprises:

> *iii) a second microcontroller, operatively coupled to said at least one display device and said power supply, capable of transmitting control signals, and capable of receiving and outputting power*[*; and*]
>
> *iv) a digital MUX, operatively coupled to said at least one battery monitor, said second microcontroller and said at least one power supply, capable of selectively receiving digital signals from one of said at least one battery monitor, and capable of receiving control signals from said second microcontroller, and capable of receiving power from said power supply, and capable of outputting digital signals.*

In an attempt to show that *Modgil* discloses a second microcontroller operatively coupled to at least one display device and the power supply, the *Final Action* states that "it is obvious that a typical mid range vehicle has as many as 50 or more microcontrollers." However, claim 13 is directed to a data collection and display device of a battery safety monitor system, not a mid-range automobile! *Modgil* discloses only one microprocessor in its battery monitor and security system. The *Final Action* offers no reason to inject a second microprocessor into the battery monitor system of *Modgil*. Regarding the digital MUX, the *Final Action* states:

> *Kopera, however, discloses a multiplexer..., but the multiplexer is an analog mux that receives voltages signals of analog inputs; and at the time of the invention it would have been obvious to a person of ordinary skill in the art to provide a*

digital multiplexer that receives a digital signals and select from one of the plurality of theses signals. (*Final Action* page 7)

However, there is no reason that one skilled in the art would randomly replace *Kopera's* analog MUX with a digital MUX because there are no disclosed digital signals to multiplex. Additionally, the *Final Action* has failed to disclose the manner of connection of the digital MUX and the presence of a power supply separate from the battery being monitored. Therefore, Appellant submits that no *prima facie* case of obviousness has been established with regards to claim 13.

III. The 35 U.S.C. 103(a) rejection of claim 15, based on *Modgil* in view of *Hemminger*, should be overturned because claim 15 depends on claim 1, which is unanticipated and unobvious.

Claim 15 is a dependant of claim 1 and as such incorporates all the limitations of its parent claim. Claim 1 has been shown above to include elements not disclosed by the cited references. As such, the obviousness rejection against claim 15 should be overturned.

IV. The 35 U.S.C. 103(a) rejection of claim 16, based on *Modgil* in view of *Kopera* and further in view of *Hemminger*, should be overturned because the *Final Action* has failed to establish a *prima facie* case of obviousness because the references alone or together do not

teach every element of the claim 16.

> *To establish prima facie obviousness of a claimed invention,* ***all*** *the claim limitations must be taught or suggested by the prior art.* (emphasis added)
> In re Royka, 490 F.2d 981, MPEP 2143.03

Claim 16 describes the wetness detector of claim 12 as comprising "two narrowly spaced conductors that are operatively coupled to a high impedance voltage and an input of said A/D converter, wherein said wetness detector is configured to produce a reduced voltage when thionyl chloride condenses on said two narrowly spaced conductors." Nowhere in the cited references either alone or in combination is there taught or suggested a wetness detector as described in claim 16. The *Final Action* states that the "combined references of *Modgil* and *Kopera* disclose battery safety monitoring system with wetness detector…[and] *Hemminger* discloses that the battery cell used is a lithium thionyl chloride cells." (*Final Action* page 8) The *Final Action* fails to address the limitation that the wetness detector comprises narrowly spaced conductors that are operatively coupled to a high impedance voltage and an input of said A/D converter and that the wetness detector is configured to produce a reduced voltage when thionyl chloride condenses on the two narrowly spaced conductors. Just the mere mention of thionyl chloride in *Hemminger* is insufficient to make claim 16 obvious. Therefore, Appellant submits that no *prima facie* case of obviousness has been established with regards to claim 16 and the rejection should be overturned.

CONCLUSION

For the reasons expressed above, the claims on appeal are unobvious and unanticipated. Therefore, the respective rejections should be overturned and a notice of allowance issued for the appealed claims. The Commissioner is authorized to charge Deposit Account No. **50-0847** an amount of **$500.00** to pay the fee for filing a brief in support of an appeal per 37 CFR 41.20(b)(2). Please charge any deficit or credit any excess to Deposit Account No. **50-0847**.

Respectfully submitted,

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CLAIMS APPENDIX

Claims Involved in the Appeal

1. A battery safety monitor system, comprising:

a) at least one battery comprising at least one cell string , wherein said at least one cell string is capable of outputting voltage signals;

b) at least one zener diode, operatively coupled to said at least one battery cell string, capable of receiving and reducing voltage signals, and capable of outputting voltage signals;

c) at least one safety device, operatively coupled to said at least one battery cell string, capable of preventing damage to said at least one battery cell string;

d) a microcontroller, operatively coupled to said at least one zener diode, capable of receiving and outputting data;

e) a display device, operatively coupled to said microcontroller, capable of receiving data, and capable of displaying at least one battery voltage level;

f) a power supply, operatively coupled to said microcontroller and said display device, capable of supplying power to said microcontroller and said display device.

2. The battery safety monitor system of Claim 1, wherein said safety device is selected from the group consisting of PTC, thermal fuse, fuse, isolation diode, wetness detector and optoisolator.

3. The battery safety monitor system of Claim 1, wherein said display device is selected from the group consisting of visual alarms, audible alarms, relay switches and serial interfaces coupled to display computers.

4. The battery safety monitor system of Claim 1, wherein said at least one battery comprises a plurality of batteries, wherein said battery safety monitor system further comprises an analog multiplexer, operatively coupled to said plurality of batteries and said at least one zener diode, capable of selectively receiving voltage signals from one of said plurality of batteries.

5. The battery safety monitor system of Claim 1, wherein said battery safety monitor system further comprises an A/D converter, operatively coupled to said at least one zener diode and said microcontroller, capable of converting voltage signals to digital signals, and capable of outputting digital signals to said microcontroller, and capable of receiving control signals from said microcontroller.

6. The battery safety monitor system of Claim 1, wherein said battery safety monitor system further comprises an optoisolator, operatively coupled to said microcontroller, said power supply and said at least one display device, capable of preventing reverse currents, and capable of receiving and transmitting digital signals, and capable of receiving power from said power supply.

7. A battery safety monitor system, comprising:

a) at least one string unit, comprising:

i) at least one battery cell string capable of outputting voltage signals;

ii) at least one safety device, operatively coupled to said at least one battery cell string, capable of preventing damage to said at least one battery cell string;

b) at least one battery monitor, operatively coupled to said at least one string unit, comprising:

i) at least one zener diode capable of receiving and reducing voltage signals, and capable of outputting voltage signals;

ii) a first microcontroller, operatively coupled to said at least one zener diode, capable of receiving and outputting data;

c) a data collection and display device, operatively coupled to said at least one battery monitor, comprising:

i) a display device capable of receiving data, and capable of displaying at least one battery voltage level;

ii) a power supply, operatively coupled to said battery monitor and said display device, capable of supplying power to said battery monitor and said display device.

8. The battery safety monitor system of Claim 7, wherein said at least one battery monitor further comprises:

iii) an analog MUX, operatively coupled to said at least one string unit and said at least one zener diode, capable of selectively receiving voltage signals from one of said at least one string unit, and capable of outputting voltage signals to said at least one zener diode.

iv) an A/D converter, operatively coupled to said at least one zener diode and said first microcontroller, capable of converting voltage signals to digital signals, and capable of outputting digital signals to said first microcontroller, and capable of receiving control signals from said first microcontroller

v) an optoisolator, operatively coupled to said first microcontroller and said data collection and display device, wherein said optoisolator is capable of preventing reverse currents, and capable of receiving and transmitting digital signals, and capable of receiving power from said power supply.

9. The battery safety monitor system of Claim 8, wherein said optoisolator further comprises:

(1) a serial interface, operatively coupled to said microcontroller and said optoisolator, capable of receiving and outputting digital signals;

(2) a connector, operatively coupled to said optoisolator and said data collection and display device, capable of receiving and outputting digital signals, and capable of receiving and outputting power.

10. The battery safety monitor system of Claim 9, wherein said serial interface comprises a UART.

11. The battery safety monitor system of Claim 9, wherein said connector comprises long wires.

12. The battery safety monitor system of Claim 8, wherein said at least one battery monitor further comprises a wetness detector, operatively coupled to said A/D converter, wherein said wetness detector is capable of detecting dangerous battery conditions.

13. The battery safety monitor system of Claim 7, wherein said data collection and display device further comprises:

iii) a second microcontroller, operatively coupled to said at least one display device and said power supply, capable of transmitting control signals, and capable of receiving and outputting power.

iv) a digital MUX, operatively coupled to said at least one battery monitor, said second microcontroller and said at least one power supply, capable of selectively receiving digital signals from one of said at least one battery monitor, and capable of receiving control signals from said second microcontroller, and capable of receiving power from said power supply, and capable of outputting digital signals.

15. The battery safety monitor system of claim 1 wherein said at least one battery is lithium based.

16. The battery safety monitor system of claim 12, wherein said wetness detector comprises two narrowly spaced conductors that are operatively coupled to a high impedance voltage and an

input of said A/D converter, wherein said wetness detector is configured to produce a reduced voltage when thionyl chloride condenses on said two narrowly spaced conductors.

17. A battery safety monitor system, comprising:

a) a battery cell string capable of outputting voltage signals;

b) a safety device, electrically coupled in series to said battery cell string, wherein said safety device is capable of preventing damage to said battery cell string;

c) a battery monitor operatively coupled to receive said voltage signals, said battery monitor comprising:

i) a zener diode configured to generate low voltage signals responsive to said voltage signals;

ii) an A/D converter configured to transform said low voltage signals into digital signals; and

iii) a first microcontroller configured to transform said digital signals into output digital signals representative of a voltage level of said battery cell string, wherein said first microcontroller is capable of transmitting control signals; and

d) a display device configured to receive said output digital signals, said display device capable of displaying battery conditions; and

e) a separate power supply, operatively coupled to said battery monitor and said display device, capable of supplying power to said battery monitor and said display device.

18. The battery safety monitor system of claim 17, wherein said battery monitor further comprises:

iv) an analog multiplexer configured to receive said control signals, wherein said analog multiplexer is disposed to selectively allow said voltage signals from one battery of said battery cell string to be received by said zener diode in response to said control signals from said first microcontroller; and

v) an optoisolator, configured to transform said output digital signals into isolated digital signals, wherein said display device is configured to receive said isolated digital signals, wherein said separate power supply is configured to supply said power to said optoisolator, and wherein said optoisolator is capable of preventing reverse currents from entering said battery cell string.

19. The battery safety monitor system of claim 18, wherein said optoisolator further comprises:

(1) a serial interface, configured to receive said output digital signals from said first microcontroller; and

(2) long wires, configured to receive said power and to guide said isolated digital signals to said display device such that said display device is located remotely from said battery monitor.

20. The battery safety monitor system of claim 18, further comprising a plurality of said battery cell strings and a plurality of said battery monitors, wherein each of said battery monitors is configured to receive said voltage signals from one of said battery cell strings, and said battery safety monitor system further comprises:

f) a digital multiplexer disposed to receive said isolated digital signals from said plurality of battery monitors; and

g) a second microcontroller configured to transmit second control signals to said digital multiplexer, wherein said digital multiplexer is disposed to selectively allow said isolated digital signals from one of said plurality of battery monitors to be received by said second microcontroller in response to said second control signals, and said second

microcontroller is disposed to transform said isolated digital signals into second output digital signals, wherein said second microcontroller is configured to transmit said second output digital signals to said display device.

21. The battery safety monitor system of claim 20, wherein said safety device comprises:

i) a positive thermal coefficient device operatively coupled in series with and in close proximity to said battery cell string, wherein said positive thermal coefficient device provides overcurrent protection to said battery cell string;

ii) a thermal fuse operatively coupled in series between said positive thermal coefficient device and said battery cell string, wherein said thermal fuse is in close proximity to said battery cell string;

iii) a fuse operatively coupled in series with said battery cell string, wherein said fuse is configured to provide overcurrent protection to said battery cell string; and

iv) an isolation diode operatively coupled in series between said fuse and said analog multiplexer, wherein said isolation diode prevents reverse currents from entering said battery cell string.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None